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A Dioptrick Problem, Why four Convex-glasses in a Telescope, shew Objects Erect. by William Molineux of Dublin Esq. R. S. Soc.

IN the *Journal des Scavans* for Munday the 17th. of September 1685. pag. 466. Amst. Edition, we find this passage. *As Perspectives of one Convex-glass make Objects appear Upright, which those of two Convex-glasses invert, and again those of three rectify; so it should seem that those of four ought to invert: And yet Experience shews us that Objects appear upright through these glasses. The Singularity of this Phenomenon obliges all Skil'd in Dioptricks to inquire the reason thereof, but hitherto they have found none. Mr. Regis, who applies himself particularly to this part of Natural Philosophy, beleives that he has hit upon the Reason, and makes us hope that he will suddenly Publish it*

Thus far the *Journal*, but it does not tell us whose remark this is, though I am apt to beleive 'twas written by Mr. Regis himself, to the Publisher of the *Journal*.

To me this *Phenomenon* appears very easily explicable, from the consideration of placing Glasses in a Tube. Which is thus; after the *Object-glass*, the *Eye-glass* is placed so much distant (towards the Eye) from the *Focus* of the *Object-glass* as is the *Focus* of the *Eye-glass*; then the middle *Eye-glass* is placed so much distant from the *Focus* of the first *Eye-glass*, as is the *Focus* of this middle *Eye-glass*; lastly the nearest *Eye-glass* is placed so much distant from the *Focus* of this middle *Eye-glass*, as is the *Focus* of this nearest *Eye-glass*; and the Eye looking through them all is placed in the *Focus* of this nearest *Eye-glass*.

I say therefore first, that one single Convex-glass, cannot properly be said by it self to shew Objects erect or reverse, but in respect of placing of the Eye that looks through it. For if the Eye that looks through such a single Convex-glass

be placed nigher thereto, then the Glasses *Focus*, the Objects are erect, if the Eye be placed juſt in the *Focus*, the Objects are neither erect nor reverſed, but all in confuſion between both; and if the Eye be placed further from the Glaſs than the *Focus*, the Objects are reverſed. I mean here diſtant Objects, the Rays flowing from any point whereof may be counted to come parallel towards the *Object-glaſs*, for ſuch Objects we are to conſider when we ſpeak of looking thro' *Telescopes*.

This being laid down, I aſſert. Secondly, that the *Object-glaſs* of a *Telescope* reverſes the Object, both to the *Eye-glaſs* and the Eye, that looks through it: For the *Eye-glaſs* is placed farther from the *Object-glaſs* than is the *Focus* of the *Object-glaſs*. But the *Eye-glaſs* does nothing towards the Rectification or Reverſion; the Eye being placed juſt in it's *Focus*. Thus we ſee that the Reverſing of Objects in a *Telescope* of two Convex-glaſſes proceeds wholly from the *Object-glaſs* and its poſition, and the *Eye-glaſs* has nothing to do in the Affaire; for were the Eye it ſelf in the place of the *Eye-glaſs* it would ſee the Objects inverted thro' the ſingle *Object-glaſs*.

I come now to conſider the ſecond *Eye-glaſs* placed after the firſt *Eye-glaſs*. (the firſt *Eye-glaſs* being that next the *Object-glaſs*) And here it is manifeſt that placing this as it ought in a *Telescope*, if we place our Eye nearer to this middle *Eye-glaſs* than it's *Focus*, the Eye ſees the Objects inverted and confuſed: Place the Eye in the *Focus*, it ſees the Objects all in confuſion, neither erect nor reverſed; for here again there is a diſtinct Representation of the Objects to be received on a piece of Paper, as in the *Focus* of the *Object-glaſs*; and the Eye being placed at any time at this place (which is uſually called the *Diſtinct- Baſe*) ſees all in confuſion. But then let the Eye be placed farther from this middle Glaſs then its *Focus* (for ſo is the third or immediate *Eye-glaſs*, it being alwayes diſtant from the middle *Eye-glaſs*, the Aggregate of both their *Foci*) it perceives the Objects erect and confuſed.

Laſt-

Lastly. the third or immediate *Eye-glass* does nothing towards the erecting or reversing the Species, which it receives erect from the middle *Eye-glass*; no more than in a Telescope of two Convex-glasses, the *Eye-glass* does to the Species it receives from the *Object-glass*, as we have shewn before. The reason that this last or immediate *Eye-glass* has nothing to do in the erecting or reversing the Species is the same, as in a Telescope of two Convex-glasses, viz. the Eye is placed in its *Focus*, and therefore sees the Species as 'tis represented in the *Distinct Base*; that is, the Species is inverted in the *Distinct Base* of the *Object-glass*, and therefore a single Convex *Eye-glass* brings it to the Eye inverted; but in the *Distinct-Base* of the middle or second *Eye-glass* the Species is erect, and therefore the third or immediate *Eye-glass* brings it to the Eye erect.

Wherefore we are to consider the Telescope consisting of an *Object-glass* and three *Eye-glasses*, as two Telescopes, each consisting of two Convex-glasses. The first consists of the *Object-glass* and first *Eye-glass*, and this inverts the Species; that is, the Species is inverted in the *Distinct-Base* of the *Object-glass*, and so brought into the Eye. The second Telescope consists of the two immediate *Eye-glasses*, and this erects what the former inverted, that is, the Species in the *Distinct-Base* of the middle *Eye-glass* is erect, and is so brought into the Eye by the *Eye-glass*; the *Eye-glasses* themselves in neither case having any thing to do with the erecting or inverting, but meerly in representing in the same posture the Species immediatly before them.

The *French Problem* therefore should not have broken a Telescope of four Convex-glasses into four peices, but into two, and the case would have been plain; whereas by breaking it into four Perspective-Glasses, they attribute that to two of them, which neither of them does, viz. inverting and erecting.

Therefore I say lastly, that one Convex-glass as posited in a Telescope inverts; the second (that is the first *Eye-glass*)

does nothing towards erecting or reversing, but represents the Image as it is in the *Distinct-Base* of the *Object-glass* before it, that is, inverted. The third Glass erects, or rather restores what was before inverted. The fourth represents the Image as it receives it from the *Distinct-Base* of the third, that is, erect. And this I think a sufficient Solution of this Problem.

An uncommon Inscription lately found on a very great Basis of a Pillar, dug up at Rome; with an Interpretation of the same by the learned Dr. Vossius.

THis Inscription was sent by that excellent Philosopher and Mathematician Mr. *Adrian Auzout*, who copied it from the Stone, to Mr. *Justel*, who was pleased to communicate it to the *Royal Society*, together with the Sentiments of Dr. *Vossius* thereupon, of which the Reader may Judge.

The Inscription is three fold upon three sides of the Basis, and as follows.

P. SVFENATI. P. F. PAL. MYRONI
 EQVITI. ROMANO. DECV
 RIALI. SCRIBARVM. AEDILI
 VM. CVRVLIVM. LVPERCO. LAVRENTI
 LAVINATI. FRETRIACO. NEAPOLI. ANTI
 NOITON. ET. EVNOSTIDON. DE
 CVRIONI. IIII, VIRO. ALBA

NI.